Asymmetric Catalysis Based on Chiral Phospholanes and Hydroxyl Phospholanes

BACKGROUND OF THE INVENTION

This application is a Continuation-~~In Part~~ of ~~and claims priority from U.S.~~ Application Serial No. 09/377,065, filed on August 19, 1999 and claims priority from U.S. Provisional Application Serial No. 60/097,473, filed on August 21, 1998.

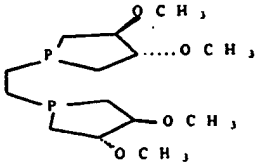
Field of the Invention

This invention relates to chiral phospholanes derived from natural products, and asymmetric catalysis using these phospholanes.

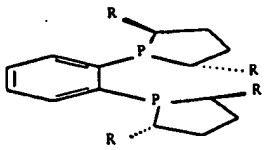
Description of Related Art

Many chiral phosphine ligands have been explored for practical application in asymmetric catalysis, but few chiral ligands or motifs are efficient for the synthesis of commercially useful chiral molecules in industry.

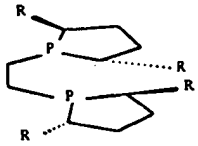
Among known chiral phosphines, several are made from electron-donating chiral phospholanes. One example is the Brunner phospholane shown below. Brunner, H., Organometal. Chem. (1987) 328, 71. However, poor enantioselectivities were observed.



Brunner phospholane



DuPhos™



BP

The ligands DuPhos™ and BPE have been used effectively for certain asymmetric hydrogenation reactions. See U.S. Patent Nos. 5,329,015; 5,202,493; and 5,329,015; Burk, M.J., J. Am. Chem. Soc. (1991) 113, 8518; Burk, M.J., J. Am.